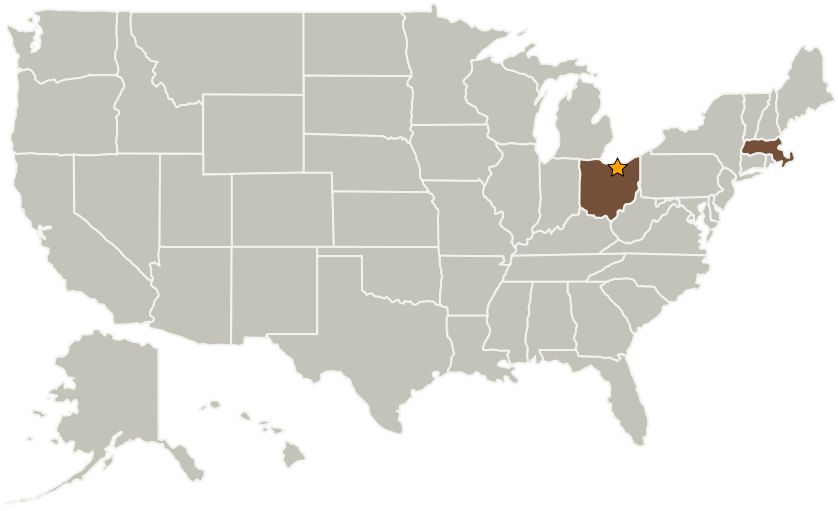
High Operating Temperature, Radiation-Hard MIM Thermophotovoltaic Converters, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

Spire Corporation proposes to investigate InGaAs thermophotovoltaic (TPV) cells optimized for high temperature operation (~150C) and radiation hardness against the 1.64MeV neutron flux likely from plutonium dioxide general purpose heat sources. We propose to develop a temperature-dependent TPV cell model and select an optimum bandgap for 150C operation with a 1100C heat spectrum, using a cell design with a thin (~1 micron vs standard ~3 micron) base that improves tolerance to diffusion length degradation from radiation. In order to increase photon absorption in this thin cell, we propose to epitaxially grow a monolithic 15 period InGaAs/InAlAs Bragg mirror to reflect about 90% of the incident usable (2 ~micron wavelength) photons back through the cell. The proposed advantage of the Bragg over a standard back metal mirror reflector is that the dielectric mirror has some ability to use strain exerted at the interfaces of the different mirror materials as a threading-to-misfit dislocation filter to further enhance the cell efficiency. We also propose to examine polyimide along with standard SiN for MIMs (monolithically integrated multijunction module) edge passivation.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Spire Corporation	Supporting Organization	Industry	Bedford, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.8 Measurement and Control